Critical Areas of Focus

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

(1) Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for pro- portions *(y/x = m or y = mx)* as special linear equations *(y = mx + b)*, understanding that the constant of proportionality *(m)* is the slope, and the graphs are lines through the origin. They understand that the slope (*m)* of a line is a constant rate of change, so that if the input or *x*-coordinate changes by an amount *A*, the output or *y*-coordinate changes by the amount $m \times A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.

Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutionsof the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

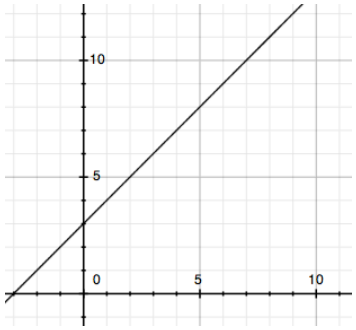
(2) Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

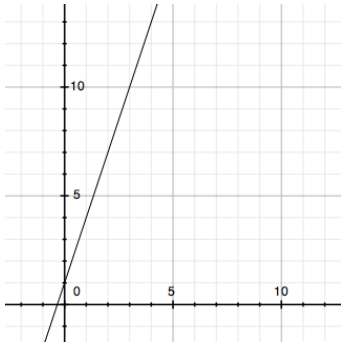
(3) Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its con- verse, and can explain why the Pythagorean Theorem holds, for example, by de- composing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

Quarter 1: District Benchmark test during dates of October 15 – 23. Tests returned to district office October 23.

Day-to-day pacing is left to the discretion of the individual collaborative teams. Mappings are to be followed to facilitate district-wide collaboration and correlation.

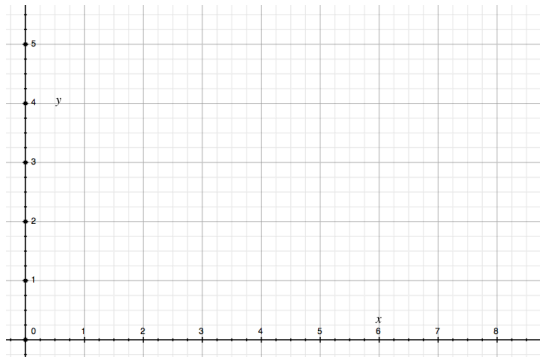
<table>
<tr><td colspan="3">Expressions and Equations 8.EE</td></tr>
<tr><td colspan="3">Understand the connections between proportional relationships, lines, and linear equations.</td></tr>
<tr><td colspan="3">5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</td></tr>
<tr><td>Depth of Knowledge Level 1</td><td>Depth of Knowledge Level 2</td><td>Depth of Knowledge Level 3</td></tr>
<tr><td>Which graph depicts the monthly cost for a cell phone service that has an initial fee of $3 and $1 for every minute it is used?

A.
 

B.
 
</td><td>Draw a graph that would represent the costs associated with the following sign:

JAKE'S SURF SHOP

Surfboard Rental $6
plus $3 per hour

 
</td><td>The Aztec Cell Phone company charges $50 per month plus 15 cents per minute. The Southern Cell Phone Company charges no monthly fee but 25 cents per minute. Susan is trying to determine which company's phone is right for her. She cannot afford to pay more than $60 per month for her phone. Which should she choose?</td></tr>
</table>

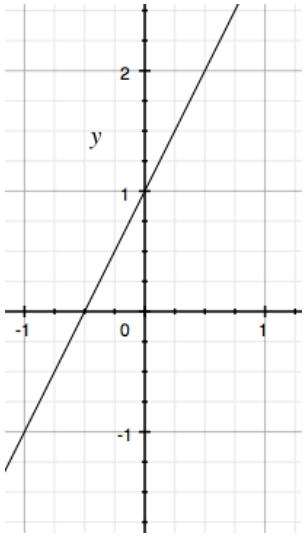
Expressions and Equations **8.EE**

Analyze and solve linear equations, linear inequalities, and pairs of simultaneous linear equations.

7. Solve linear equations and inequalities in one variable.
   a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).
   b. Solve single variable linear equations and inequalities with rational number coefficients, including equations and inequalities whose solutions require expanding expressions using the distributive property and collecting like terms.
   c. Solve single variable absolute value equations.

Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3
Solve: 3(x – 5) = 6	A. Using the equation 2 = 5x – 13, create a slight change that would make the equation have no solution. B. Using the equation 2 = 5x - 13, create a slight change that would make the equation have infinitely many solutions.	Place a checkmark in the appropriate column.

	always true	some-times true --- When?	never true
3 + x = x + 3			
2 – x = x – 2			
4x = 4			
2(x + 1) = 2x + 1			
3x – 5 = 2x			

Functions		**8.F**
Define, evaluate, and compare functions. (Notation function is not required in Grade 8)		
2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3
Two functions are depicted. Which has the fastest rate of change? A.  B. x | y 0 | 3 1 | 4 2 | 5 3 | 6 4 | 7	A. A function is depicted. Write an equation that describes the function. x | y 0 | 3 1 | 4 2 | 5 3 | 6 4 | 7 B. Create a function that has a faster rate of change than the one depicted. C. Draw a graph of a function that has a smaller y-intercept than that depicted in part A.	Write two functions that have the same rate of change, but different y-intercepts. Demonstrate their similarities and differences using a table and a graph.

<table>
<tr><td colspan="3">Functions 8.F</td></tr>
<tr><td colspan="3">Define, evaluate, and compare functions. (Notation function is not required in Grade 8)</td></tr>
<tr><td colspan="3">3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.</td></tr>
<tr><td>Depth of Knowledge Level 1</td><td>Depth of Knowledge Level 2</td><td>Depth of Knowledge Level 3</td></tr>
<tr><td>The function y = -2x -1 creates a straight line when graphed and is represented in the following table.

<table><tr><td>x</td><td>y</td></tr><tr><td>-1</td><td>1</td></tr><tr><td>0</td><td>-1</td></tr><tr><td>1</td><td>-3</td></tr><tr><td>2</td><td>-5</td></tr></table>
Alter <u>one</u> entry in the table that would cause the graph to no longer be linear.</td><td>A linear function is described by the points (3, 3) and (5, 7). Provide another point that lies on the straight line described.</td><td>Determine which of the functions listed below are linear and which are not linear and explain your reasoning.

• $y = -2x^2 - 3$
• $y = 2x + 3$
• y = 2x linear
• $A = \pi r^2$
• $y = 0.25 + 0.5(x - 2)$</td></tr>
</table>

<table>
<tr><td colspan="3">Functions 8.F</td></tr>
<tr><td colspan="3">Use functions to model relationships between quantities. (Notation function is not required in Grade 8)</td></tr>
<tr><td colspan="3">4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</td></tr>
<tr><td>Depth of Knowledge Level 1</td><td>Depth of Knowledge Level 2</td><td>Depth of Knowledge Level 3</td></tr>
<tr><td>A rental car company charges $45 a day for the car as well as charging a one-time $25 fee for the car's navigation system (GPS).Write an expression for the cost in dollars, c, as a function of the number of days, d.</td><td>The table provided describes a linear equation.
<table><tr><th>Days (d)</th><th>Cost (c) in dollars</th></tr><tr><td>1</td><td>70</td></tr><tr><td>2</td><td>115</td></tr><tr><td>3</td><td>160</td></tr><tr><td>4</td><td>205</td></tr></table>
Write a linear equation that models this situation. What is the initial value? What is the rate of change?</td><td>When scuba divers come back to the surface of the water, they need to be careful not to ascend too quickly. Divers should not come to the surface more quickly than a rate of 0.75 ft per second. If the divers start at a depth of 100 feet, the equation d = 0.75t – 100 shows the relationship between the time of the ascent in seconds (t) and the distance from the surface in feet (d).

Will they be at the surface in 5 minutes? How long will it take the divers to surface from their dive? Make a table of values showing several times and the corresponding distance of the divers from the surface. Explain what your table shows. How do the values in the table relate to your equation?</td></tr>
</table>

Quarter 2: SAGE Interim Test during dates of January 4 – 15.

Day-to-day pacing is left to the discretion of the individual collaborative teams. Mappings are to be followed to facilitate district-wide collaboration and correlation.

Expressions and Equations		**8.EE**
Understand the connections between proportional relationships, lines, and linear equations.		
6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Expressions and Equations		**8.EE**
Analyze and solve linear equations, linear inequalities, and pairs of simultaneous linear equations.		
8. Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables graphically, approximating when solutions are not integers. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. c. Solve real-world and mathematical problems leading to two linear equations in two variables graphically. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Functions		**8.F**
Define, evaluate, and compare functions. (Notation function is not required in Grade 8)		
1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Functions		**8.F**
Define, evaluate, and compare functions. (Notation function is not required in Grade 8)		
2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Functions		**8.F**
Define, evaluate, and compare functions. (Notation function is not required in Grade 8)		
3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Functions		**8.F**
Use functions to model relationships between quantities. (Notation function is not required in Grade 8)		
4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Functions		**8.F**
Use functions to model relationships between quantities. (Notation function is not required in Grade 8)		
5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Quarter 3: District Benchmark test during dates of March 18 - 25. Tests returned to district office March 25.

Day-to-day pacing is left to the discretion of the individual collaborative teams. Mappings are to be followed to facilitate district-wide collaboration and correlation.

Statistics and Probability		**8.SP**
Investigate patterns of association in bivariate data.		
1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Statistics and Probability		**8.SP**
Investigate patterns of association in bivariate data.		
2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Statistics and Probability		**8.SP**
Investigate patterns of association in bivariate data.		
3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Statistics and Probability		**8.SP**
Investigate patterns of association in bivariate data.		
4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Expressions and Equations		**8.EE**
Work with radicals and integer exponents.		
1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Expressions and Equations		**8.EE**
Work with radicals and integer exponents.		
3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Expressions and Equations		**8.EE**
Work with radicals and integer exponents.		
4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Number System		**8.NS**
Know that there are numbers that are not rational, and approximate them by rational numbers.		
1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Number System		**8.NS**
Know that there are numbers that are not rational, and approximate them by rational numbers.		
2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., $\prod^2$). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Quarter 4: SAGE Summative Test during dates of March 28 – May 20. Strive to have math tested April 25 – May 13, so that make-up can take place May 16 – May 20.

Day-to-day pacing is left to the discretion of the individual collaborative teams. Mappings are to be followed to facilitate district-wide collaboration and correlation.

Expressions and Equations		**8.EE**
Work with radicals and integer exponents.		
2. Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Number System		**8.NS**
Work with radicals and integer exponents.		
3, Understand how to perform operations and simplify radicals with emphasis on square roots.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Understand congruence and similarity using physical models, transparencies, or geometry software.		
1. Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Understand congruence and similarity using physical models, transparencies, or geometry software.		
2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Understand congruence and similarity using physical models, transparencies, or geometry software.		
3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Understand congruence and similarity using physical models, transparencies, or geometry software.		
4. Understand that a two-dimensional figure is similar to another if the second can be ob- tained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Understand congruence and similarity using physical models, transparencies, or geometry software.		
5. Use informal arguments to establish facts about the angle sum and exterior angle of tri- angles, about the angles created when parallel lines are cut by a transversal, and the angle- angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Understand and apply the Pythagorean Theorem and its converse.		
6. Explore and explain proofs of the Pythagorean Theorem and its converse.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Understand and apply the Pythagorean Theorem and its converse.		
7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Understand and apply the Pythagorean Theorem and its converse.		
8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3

Geometry		**8.G**
Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.		
9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.		
Depth of Knowledge Level 1	Depth of Knowledge Level 2	Depth of Knowledge Level 3